REMARKS

The Applicants gratefully acknowledge the interview granted to Professor Mazzola and their representative on June 8, 2005, and wish to thank Examiner Im and Supervisory Examiner Loke for their courteous assistance during the interview. The substance of that interview is summarized and expanded upon below.

As was discussed during the interview, the claims have been amended to clearly recite that the semi-insulating silicon carbide layer is a single layer. The claims have otherwise been amended for clarity. Claims 47 and 48 have canceled in favor of new claims 55 and 56. All amendments find support in the specification as originally filed, and no new matter is believed to be added. Upon entry of these amendments and consideration of the remarks below, which are consistent with the discussion at the interview, this application is in condition for immediate allowance.

As was discussed at the interview, the claimed subject matter makes it possible to create an entire class of power devices and integrated circuits, which have significant performance advantages over conventional devices. For example, with the claimed subject matter, vertical power devices may be integrated on the same chip as lateral power devices or lateral control circuitry to form complex, multifunctional monolithic circuits in SiC. The claimed subject matter has tremendous value for high temperature integrated circuits and high-power discrete and integrated devices; it is applicable to compact, solid-state television and radar transmitters operating from VHF to above X-band; it is suitable for military applications, such as airborne radar systems, and commercial applications such as television transmitter stations, cellular telephone base stations, satellite communication links and efficient power switching and motor drive control circuitry.

As presently amended, and as was apparent during the interview, the claims present patentable subject matter, and this application is in immediate condition for allowance. The Examiner is kindly requested to pass this case to issue.

Rejection Under 35 U.S.C. §112

The Applicants acknowledge the rejection of Claims 1, 38, 47, 48, 51 and 54 under 35 U.S.C. §112, second paragraph. This rejection is traversed. Claims 47 and 48 have been canceled in favor of new Claims 55 and 56. The claims are not indefinite, and this rejection should be withdrawn.

As was discussed during the interview, the invention is clearly set out in the claims, and the boundaries of the claims are clear. For convenience, Claim 1, the broadest claim in the case, is repeated below:

> Claim 1: A microelectronic device, comprising:
>
> a substrate;
>
> a single semi-insulating silicon carbide layer formed on the substrate, the semi-insulating silicon carbide layer comprising boron and a shallow donor impurity, the semi-insulating silicon carbide layer having boron-related D-center defects formed therein; and
>
> a first semiconductor device formed on the semi-insulating silicon carbide layer, the first semi-conductor device having an active area comprising a high bandgap material.

There is nothing unclear about this claim. This claim clearly recites that the semi-insulating silicon carbide layer is a single layer, that it comprises boron and a shallow donor impurity, that it has boron-related D-center defects formed therein, that a first semiconductor

device is formed on the semi-insulating silicon carbide layer, and that the semiconductor device comprises a high bandgap material. One of ordinary skill in the art would clearly know when one is inside or outside the boundaries of not only this claim, but of all the claims in the case.

At the interview it became apparent that the Office misunderstood the former term, "non-composite" referring to the semi-insulating silicon carbide layer. This term has been removed, and the claims now recite that the semi-insulating silicon carbide layer is a single layer. The fact that the semi-insulating silicon carbide layer can be a single layer finds clear support in the specification as originally filed. See, e.g., element 3 in Figure 1 and element 22 in Figure 2 and the accompanying descriptions in the specification. As Professor Mazzola pointed out during the interview, a single semi-insulating silicon carbide layer can comprise boron, a shallow donor impurity, and boron-related D-center defects. Indeed, the present specification teaches as much, and the present claims require as much. The Applicants traverse the Examiner's assertions to the contrary on page 2 of the Official Action, since those assertions are simply incorrect.

There is nothing unclear about Claims 51 and 54. The term, "co-doped with boron and nitrogen during the epitaxial growth" is easily understood by anyone of ordinary skill in the art. The Applicants traverse the Examiner's assertion that "the instant invention does not disclose this aspect [of co-doping]" (page 3 Official Action), and the Applicants kindly point out page 8, lines 16ff of the specification, which clearly describes the use of the boron related D-center to compensate shallow nitrogen donors during growth of SiC epitaxial layers. Accordingly, for this and the above reasons, and in view of the amendments, the boundaries of the claims are clear; the claims are not indefinite; the rejection is unsustainable; and the rejection must be withdrawn.

Rejection Under 35 U.S.C. §102

The Applicants acknowledge the rejection of Claims 1, 2, 5-15, 19, and 49-51 under 35 U.S.C. §102(b) over Palmour (U.S. Patent No. 5,270,554) with consideration of Kodama (U.S. Patent No. 5,967,794). This rejection is traversed.

The anticipation rejection should be withdrawn. Palmour lacks any teaching of boron related D-center defects. The Office is not correct when it asserts that Palmour inherently discloses boron related D-center defects. There is nothing in Palmour to lead one to believe that boron-related D-center defects are present, inherently or otherwise, in Palmour's silicon carbide layer. There is nothing in any of the cited references to lead one to believe that boron related D-center defects are present, inherently or otherwise, in Palmour's silicon carbide layer. The Office's assertion is without support, and Palmour does not anticipate the subject matter of the claims.

As Professor Mazzola so clearly pointed out during the interview, the mere presence of boron in silicon carbide does not inherently result in boron related D-center defects; and none of the methods described in Palmour would inherently result in an SiC layer having boron related D-center defects.

The Office relies on the Kodama reference to remedy Palmour's lack of any teaching of boron-related D-center defects. This reliance is misplaced, however.

As was pointed out during the interview, Kodama does not teach that boron-related D-center defects are inherently present in silicon carbide layers. Instead, Kodama teaches that boron-related defects are a problem in semiconducting *silicon* substrates, and this has nothing to do with the semi-insulating *silicon carbide* layer described in Palmour, and it has nothing to do with the claimed subject matter.

Kodama does not support the Office's assertion that the presence of boron in a silicon carbide layer inherently leads to boron related D-center defects. Kodama teaches something completely different: (1) that boron tends to recombine with point defects in a silicon substrate (leading to increased defect-enhanced diffusion); and (2) because carbon has a stronger tendency than boron to combine with excess point defects in silicon, the addition of carbon will reduce the combination of boron with point defects in silicon (to reduce defect-enhanced diffusion). Kodama relates to the reduction of boron related point defects in semi-conducting silicon substrates. Kodama does not relate to the inclusion of boron related D-center defects in a semi-insulating silicon carbide layers. If anything, Kodama appears to teach the opposite of what the Office asserts. For convenience, the relevant portions of Kodama are repeated below:

> "However, it is well known that boron which is a P-type impurity tends to be recombined with point defects in a ***silicon substrate*** resulting in defect enhanced diffusion." Kodama column 1, lines 35-38, emphasis added.

> "In order to prevent the influence of the defect enhanced diffusion of boron and to prevent a variation of diffusion depth, a simultaneous injection of boron and carbon and a subsequent heat treatment have been studied. Since carbon has a stronger tendency to combine with excess point defects in a silicon substrate than boron, it is possible to ***reduce combination of boron with point defects in silicon*** to thereby reduce defect enhanced diffusion of boron." Kodama column 3, lines 36-44, emphasis added.

Given the teachings in Kodama, as exemplified by the passages above, there is no basis to conclude that Palmour's silicon carbide layers inherently contain boron related D-center defects. Kodama does not cure the deficiency of Palmour. Palmour does not anticipate the subject matter of the claims. The anticipation rejection is unsustainable, and it should be withdrawn.

Rejections Under 35 U.S.C. §103

The Applicants acknowledge the rejection of Claims 38-40, 44 and 52-54 over the combination of Ajit (U.S. Patent No. 6,310,385) and Palmour. This rejection is traversed.

The Office relies on Palmour to provide the semi-insulating SiC layer in the claims. The Office relies on Ajit only for the multiple device components of the claims. This rejection must fail. As noted above, Palmour does not teach the SiC layer as claimed, and Ajit does not cure this deficiency. Ajit does not teach an SiC layer having boron related D-center defects. The claimed subject matter is not obvious over the combination of Ajit and Palmour, and this rejection should be withdrawn.

The Applicants acknowledge the rejection of Claims 16-18 over Palmour in view of Fujita (U.S. Patent No. 4,794,608). These are dependent claims, which incorporate all the limitations of Claim 1 by reference. As noted above, Palmour does not teach the SiC layer as claimed. Fujita does not mention silicon carbide at all, and thus this reference cannot cure the deficiencies of Palmour. Since Palmour does not anticipate or obviate the broad claims, the addition of the Fujita reference cannot make dependent Claims 16-18 obvious. This rejection should be withdrawn.

The Applicants acknowledge the rejection of Claims 41-43 and 45-48 over the combination of Ajit, Palmour and Alok (U.S. Patent No. 6,303,508). Again, these are

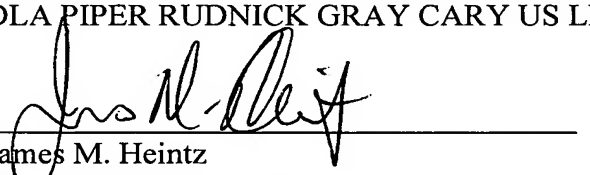
dependent claims, which incorporate the limitations of independent Claim 38 by reference. The combination of Palmour and Ajit, as noted above, does not obviate the subject matter of Claim 38. The Alok reference relates to removing carbon to form silicon regions in silicon carbide. Boron is not mentioned at all. Accordingly, the addition of Alok reference does not cure the deficiencies of Palmour and Ajit with respect to independent Claim 38. The addition of Alok cannot make dependent Claims 41-43 and 45-48 obvious. This rejection should be withdrawn.

Conclusion

This application is now in condition for allowance and issue. An early and favorable indication of same is kindly requested. If any points remain at issue, however, the Examiner is kindly requested to contact the undersigned at the telephone number listed below, who would be happy to provide any assistance in putting this case into even better condition for allowance.

Respectfully submitted,

DLA PIPER RUDNICK GRAY CARY US LLP



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